of these patients died of septicemia, or perforation followed by peritonitis, others showed sequelae of streptococcus origin.[3] Dysentery bacilli were found in 18 cases (three of these were classed as bacilli carriers) although they were repeatedly sought for in several stools from each patient. Gas bacilli were recovered repeatedly from 33. 1912 was a "gas bacillus" year; these organisms appeared in unusually large numbers in 53 out of 135 cases examined. Dysentery bacilli were recovered from five cases, and streptococci from but six. That is to say, the very severe, acute summer diarrheas of bacterial causation present a very constant syndrome consisting of prostration and fever associated with mucus, pus, and, frequently, blood in the movements. It is frequently very difficult to determine the organism causing the disease. Bacteriologically considered these cases are of varied etiology, caused by organisms of very unlike characteristics. One year the dysentery bacillus was the dominant type met with, a second year streptococci were conspicuous, while a third summer was noteworthy because of the great number of cases in which the gas bacillus was the prominent organism encountered. It should be stated that each of the above types were found each year; the striking feature is the shifting of the dominant organism from year to year.

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TWO TYPES OF INFECTIOUS DIARRHEA IN INFANTS.

BY RICHARD M. SMITH, M.D., BOSTON.

THE classification of the acute gastro-intestinal diseases of infants has been the subject of much discussion and controversy for many years. Abt[1] has made a careful resumé of this literature and it is unnecessary for me to repeat it at this time. I should like, however, to point out certain features of our present conceptions of the acute disturbances of the intestinal tract. The chronic affections will not be considered in this discussion.

The literature of a few years ago and to a certain extent of today contains a great deal concerning gastric symptoms and intestinal symptoms in the acute gastro-intestinal disturbances as though the two groups of symptoms indicated separate and distinct conditions. The tendency of the present time is away from this conception and toward the belief that we are dealing with conditions which in different individuals show gastric or intestinal symptoms, as the case may be. The vomiting and the diarrhea occur together, one or the other in excess, according to various circumstances, but both arising from the same causes.

Many acute disturbances of the gastro-intestinal tract arise from errors in feeding or from the temporary inability of the individual infant to digest a correct food. This temporary inability may be due to extraneous causes, such as variations in the temperature, humidity and environment or to acute disease. The errors in feeding are due to the improper administration of one of the food elements, fat, carbohydrate or proteid. The signs and symptoms of the disturbances due to these factors are well known and need not be recited at this time. It is probable also that salts bear a similar etiological connection with certain of the acute gastro-intestinal disturbances. The symptoms of this group are not well defined at the present time, though a considerable amount of work has been done in this connection.

We are coming to understand better the relationship between bacteria and these acute gastro-intestinal disturbances. It is not universally acknowledged that bacteria have any important connection with these conditions, but it seems to me that the arguments against their influence are not well sustained. Bacterial activity must still be considered as bearing upon these diseases. Bacteria occupy a secondary position in some instances and a primary position in others. The distinction between these two groups of cases should be carefully drawn for the treatment is quite dissimilar. We recognize that many bacteria are normal inhabitants of the intestinal tract of infants and that the number and character of these organisms may vary greatly in health and disease under different conditions of diet. These normal bacteria probably have little to do with the causation of acute gastro-intestinal disease or at any rate we do not at present understand what the relationship is between these bacteria and disease, provided one exists.

In a large number of cases of acute gastro-intestinal disease bacteria are the primary cause of the disturbance. Such cases may be grouped together under the term infectious diarrhea. This is in some ways an unfortunate name, but it emphasizes one important feature which all these cases have in common, namely, infection. We are dealing just as truly with infectious diseases as in typhoid or pneumonia. It would perhaps be worth while to enumerate the symptoms in this group of diseases. The onset is sudden. The incubation period is variable but probably short, often a matter even of hours. So far as we know there are no prodromal symptoms. There is a rise in temperature often to 104° or 105°, and this fever is continuous for several days. Prostration is present and often marked even to complete collapse which may occur within a few hours after the beginning of the attack. Nervous symptoms are common, such as twitching, restlessness or convulsions. Vomiting and diar-

rhea occur early. Vomiting is usually present at the beginning in most cases but is not as important a feature as the diarrhea. The diarrhea may be so severe that there are 20-30 stools in twenty-four hours. The stools vary in character, but usually contain pus, blood and mucus. The prostration and toxic symptoms are not directly proportionate to the severity of the diarrhea, except that the marked loss of liquids leads to a condition of depletion, with depressed fontanelle, hollow eyes, dry skin, sunken abdomen and modified breathing. This is a familiar picture. We used to be content with the classification as infectious diarrhea, but now we recognize that in this general group there are definite subdivisions according to the particular organisms concerned and that from the point of view of treatment it is quite as important to separate the subdivisions as to classify into the larger group. Clinically it is very difficult to differentiate these subdivisions because of the similarity in the picture produced by the different bacteria. At the present time a bacteriological examination of the stools is necessary to make this differentiation absolute.

Certain varieties of intestinal bacteria causing these diseases have been well known for some time. The dysentery bacillus, both the Shiga and Flexner type, has received the greatest amount of attention. Recently also it has been recognized that the gas bacillus is a causative factor in a considerable number of cases. Whether the streptococcus is entitled to a group division is open to question. It seems not unlikely that its relation may be a complicating one, perhaps like the relationship which it bears to scarlet fever. There are still many cases of infectious diarrhea in which neither dysentery bacilli nor gas bacilli can be isolated from the stools and in which there are no very large number of streptococci. The identification of other particular organisms is a problem toward the solution of which a large amount of work has been done at the Floating Hospital. Much further investigation is needed in this direction. There must be a combined clinical and bacteriological study to establish, if possible, the relationship existing between the clinical picture and the bacteriological finding in the stools.

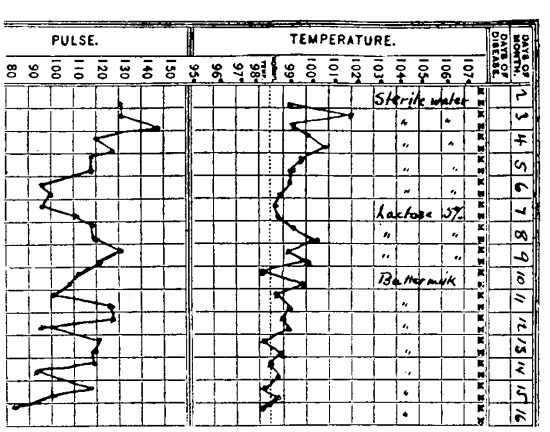
From the study of a large number of cases during the last few years we have been struck by certain facts which may point in the direction of future determinations. To understand these we must bear in mind considerations which we already know in regard to the organisms previously identified. Kendall[2] has pointed out the fact that dysentery bacilli when grown in media containing an excess of carbohydrates use the carbohydrates first and only enough proteid to furnish the nitrogen requirements of their living body structure. The same thing occurs when these bacteria grow in the intestinal tract. Since the toxic products are largely the result of the proteid breakdown we should expect a minimum of toxic products in the presence of an excess of utilizable carbohydrates. This has been demonstrated to be the case in the laboratory and we believe also with individual patients. The detailed report of these studies has already been published.[3]

The gas bacillus flourishes on a carbohydrate diet and if given carbohydrate food will continue to multiply almost indefinitely since it forms a very small amount of acid and therefore its reproduction is not self-limited. Patients ill with gas bacillus infection would grow worse therefore if fed on a high carbohydrate diet and improve on a diet low in carbohydrates. This has been shown to be the case. Lactic acid milk is a food of low carbohydrate and high protein composition. It contains lactic acid, which is detrimental to the development of the gas bacillus. Its beneficial effect on patients ill with gas bacillus infection has been proved conclusively. Observations on this condition have also been published.[4]

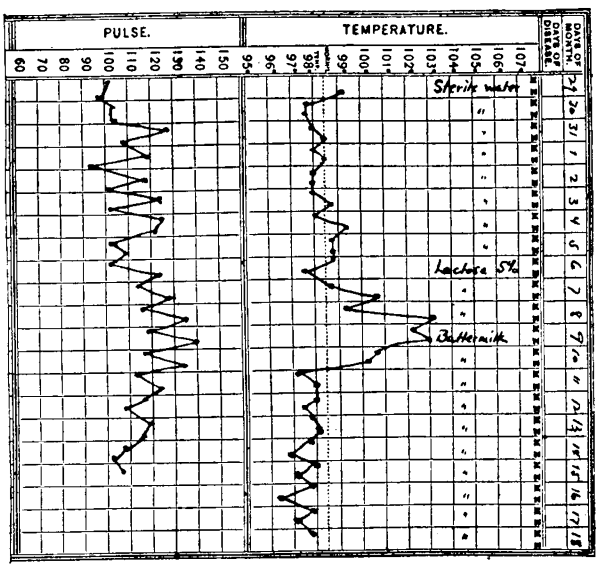
It will be seen that the dysentery bacillus cases and the gas bacillus cases are sharply contrasted in this particular—that the patients with dysentery bacillus infection do well on carbohydrate feeding and badly on proteid feeding, while the gas bacillus cases do well on proteid feeding and badly on carbohydrate feeding.

During the last summer a number of cases were observed on the boat which did not at first examination show the presence of the gas bacillus in the stools, and yet their response to treatment was identical with cases infected with gas bacillus. In the majority of these cases gas bacilli were subsequently isolated from the stools, though in many instances a considerable number of days elapsed before the organisms were found. A few of the cases never showed the presence of gas bacilli in the stools. Illustrative cases will make this point clear:—

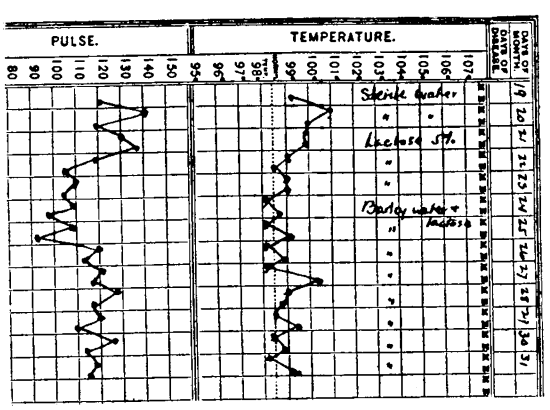
CASE 1087. History of acute diarrhea. Stools containing mucus, pus and blood. Given oil and sterile water and then lactose. Rise in temperature and pulse. Evidently not improved. Given buttermilk and improvement began. Shows unfavorable response to carbohydrate feeding and benefit from buttermilk. Gas bacilli were found in the stools.



CASE 1073. Fifteen months old. History of diarrhea. Stools containing mucus, pus and blood. Given castor oil, sterile water and then lactose. Rise in temperature, general condition not so good. Stools not markedly changed. Given buttermilk. Immediate fall in temperature and recovery. Shows unfavorable response to carbohydrate feeding and favorable response to buttermilk. Gas bacilli were found in the stools.



CASE 1168. Ten months old. Gave history of acute diarrhea. Stools contained mucus, pus, and blood. Given castor oil, sterile water and carbohydrate feeding. Diarrhea cured. Shows favorable response to this form of treatment. Organisms not determined, *i.e.* no dysentery or gas bacilli were found. Surely not gas bacillus infection.



It will be seen from these cases, and they are typical of many others which occurred on the boat during the season, that in patients where the bacterial findings in the stools are uncertain or undetermined if the response to feeding with carbohydrate diet is unfavorable, as evidenced by increase in temperature, frequency of stools or increased toxicity, it is a fair assumption that the bacteria causing the disturbance are the gas bacilli or in any event, organisms closely related to the gas bacillus. It would seem that quite possibly a further study of similar cases will reveal the presence of other organisms which bear a close relationship to the gas bacillus. From a clinical point of view it is evident that at the present time we shall do well to consider cases of acute infectious diarrhea as belonging to one or the other of two main groups of infection and to treat them in accordance with the principles known to be beneficial for the organisms standing as a type of the two groups, the dysentery bacillus and the gas bacillus.

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PREPARATION OF COMMON INFANT FOODS.

BY ROBERT B. HUNT.

THE modification of milk and the preparation of the various infant foods as carried on in the home, is frequently attended with difficulties of one kind or another, due principally to inexperience along this line of technic on the part of the individual who has undertaken the task of preparing the baby's diet.

The object of this paper is to place before the home, simple, time and labor saving methods for preparing several of the common infant foods as well as a few words on the relative merits of the ingredients to be used.

Barley Water. Three-quarters of an ounce of barley flour is added to one quart of cold water and boiled for twenty minutes. Then add water to make up the original amount, and strain the contents through several thicknesses of gauze. The flour when placed in water becomes lumpy and no amount of boiling will break up these masses. This difficulty may be overcome in two ways: first, a small amount of water may be added to the flour and thoroughly mixed, thus making a paste which will be nearly free from lumps. The second but better method is as follows: Partially submerge a fine wire strainer in the cold water to be used, pour the flour on the water in the strainer and stir gently with a spoon until the flour is in solution. The flour is quickly dissolved and the barley water will be absolutely free from lumps.

Whey. Heat fat free milk (skimmed) to about 100° F., or if you have no thermometer, to a point when a drop on the back of the hand feels neither hot nor cold. Add enough rennet or essence of pepsin to form a junket-like mass. Stir well to break the mass as finely as possible and allow to stand for ten minutes. Pour off the top and strain through several thicknesses of gauze. If the whey is to be added to milk or